Forest Fire Event Report

Event Title: Enhancing International Cooperation for Integrated Forest Fire Management
Location: Ankara, Türkiye
Dates: June 16-17, 2025
Hosted by: General Directorate of Forestry (OGM), Türkiye
Co-organized by: World Bank
Funded by: Korea Green Growth Trust Fund (KGGTF)

Entegre Orman Yangını Yönetimi için
Uluslararası İşbirliğinin Geliştirilmesi Çalıştayı

Enhancing International Cooperation for
Integrated Forest Fire Management

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Preface

This knowledge exchange was made possible through the collaboration and dedication of many organizations and individuals. We extend our sincere appreciation to our co-hosts, the Turkish Ministry of Agriculture and Forestry for their leadership and vision in convening this event.

We also thank the World Bank's Environment Team in the ECA Region, the Country Management Unit for Türkiye, the World Bank Treasury, the Disaster Risk Management Team, and the Climate Change Global Team for their technical contributions. Their expertise and commitment were instrumental in shaping the program and fostering meaningful dialogue.

We gratefully acknowledge the financial support of the Korea Green Growth Trust Fund, whose contribution made this knowledge exchange and the preparation of this report possible.

Special thanks go to the organizing team, whose tireless efforts ensured a smooth and impactful exchange, and to all speakers, moderators, and facilitators for sharing their knowledge and perspectives. Above all, we are grateful to the participants for their active engagement, valuable insights, and collaborative spirit.

Climate Resilient Forests Project team, Turkiye
Neeta Hooda & Leela Raina
Co-Task Team Leads, World Bank

Executive Summary

A comprehensive knowledge exchange was held in Türkiye from June 16-18, 2025, focusing on integrated forest fire management (IFM) amid escalating global forest fire risks. The event brought together over 150 participants from more than 16 countries, including policymakers, technical experts, and development partners, to share innovations, strategies, and foster regional cooperation for forest fire resilience across Europe and Central Asia.

Integrated Forest Fire Management and Technological Innovations

The discussions emphasized a decisive shift from reactive fire suppression to a holistic IFM approach encompassing prevention, early warning, community engagement, and enabling policy frameworks. Global platforms such as the FAO Global Fire Hub are helping to drive this shift by providing tools, guidelines, and training to support country-specific IFM policies.

Advanced technologies were a central theme, including the FireSat satellite constellation, which delivers near real-time fire detection with minimal false positives, and AI-powered tools leveraging Earth Observation data for risk assessment and early warning. Türkiye's General Directorate of Forestry (OGM) showcased its sophisticated AI-enabled detection network, UAV surveillance, and rapid-response capabilities, supported by a fleet of helicopters, aircraft, and thousands of firefighting vehicles.

Regional cooperation efforts were also highlighted, particularly the work of the Asian Forest Cooperation Organization (AFoCO), which supports fire resilience initiatives in 17 Asian countries through funding, capacity building, and governance reforms. Speakers stressed that technological innovation must be tailored to local contexts and embedded in strong institutional collaboration to ensure long-term sustainability.

National and Regional Fire Management Frameworks

Türkiye's fire risk is substantial, with 64% of its forest area classified as fire-prone. In 2024 alone, the country experienced 3,797 fires, yet 94% were contained to under 10 hectares thanks to the rapid mobilization of over 25,000 trained firefighters, an extensive detection network, and a volunteer force exceeding 130,000 people. The OGM's command-and-control systems integrate satellite feeds, drones, and thermal imaging, enabling data-driven decision-making.

However, challenges persist, particularly in interagency coordination between the OGM and the Disaster and Emergency Management Authority (AFAD), which is responsible for fires in non-forested rural areas. The adoption of the Incident Command System (ICS) for a unified, multi-agency response remains uncertain but was identified as a critical opportunity for improving operational coordination. Expanding risk-reduction measures, such as prescribed burning and forest thinning, was also recommended to improve landscape resilience.

Country experiences provided valuable perspectives: South Korea employs integrated detection and evacuation alert systems; Australia blends scientific research with Indigenous fire knowledge; France focuses on early detection and urban interface protection; Canada prioritizes prevention through forest thinning and Indigenous partnerships; and the United States emphasizes community engagement and risk modeling.

Financing and Policy for Fire Resilience

Financing resilience was a key focus, with discussion of innovative instruments such as Forest Resilience Bonds, Forecasted Mitigation Units (carbon credits for avoided emissions), and wildfire resilience insurance. These tools aim to mobilize private capital and incentivize proactive forest management, with evidence showing that prevention investments can generate returns up to 14 times their initial cost.

Indonesia's experience stood out: allocating just 1% of forestry revenues to community-based fire prevention has proven both sustainable and effective. The Indonesia Environment Fund blends public and private climate finance to support resilience projects, serving as a model of integrated governance and financing.

Philanthropic contributions are also accelerating innovation, funding the development of early detection technologies, autonomous response systems, and decision-support tools that enable the scaling of prescribed burns and fuel treatments.

Enhancing International Cooperation for Integrated Forest Fire Management

Community Engagement and Governance

Community-based approaches emerged as essential to effective fire management. Initiatives such as the U.S. Firewise USA program empower residents to reduce ignition risks through neighborhood action. Portugal's Safe Villages – Safe People program and Türkiye's nationwide public awareness campaigns underscore the importance of education and citizen participation in managing the wildland–urban interface.

Strong governance and interagency coordination were identified as prerequisites for success. Clear national leadership that aligns forestry, disaster management, climate, and finance authorities enables more effective risk management and rapid response. Cross-border collaboration and regional knowledge exchange were also emphasized as critical for tackling transboundary fire risks.

Key Takeaways and Recommendations

- **Prioritize prevention** – Invest in fuel management, early warning, and ecosystem restoration over costly suppression.
- **Maintain ecological balance** – Recognize fire's role as a natural process in many landscapes to prevent excessive fuel buildup.
- **Integrate technology and tradition** – Combine AI, satellite imagery, UAVs, and traditional knowledge to strengthen detection and response.
- **Build capacity** – Enhance preparedness through training, education, and active community engagement.
- **Ensure sustainable financing** – Expand the use of innovative financial instruments and blended finance to scale prevention.
- **Cooperate across borders** – Use regional platforms and shared data systems to coordinate fire management and early warnings.
- **Act with urgency** – Climate change is intensifying fire frequency and severity, requiring immediate political will, investment, and collaboration.

The event concluded with calls to strengthen interagency coordination in Türkiye, accelerate ICS adoption, expand fuel management measures, and bolster preparedness for upcoming high-risk fire seasons. Overall, the exchange reinforced the need for integrated, ecologically grounded, and collaborative fire management strategies to safeguard forests, communities, and climate objectives.

Annex: Additional Resources and Feedback

Participants had access to a wide range of resources, including presentation materials, an interactive learning journey in multiple languages, and a detailed attendee and collaboration network. Feedback was overwhelmingly positive—93% rated the event quality as excellent and affirmed its direct relevance to their work. Suggestions included expanding interactive discussions, hosting the exchange annually, and increasing experiential learning opportunities.

This report documents a pivotal regional initiative to strengthen IFM through multi-sectoral dialogue, technological innovation, financing strategies, and community engagement—providing a strategic foundation for continued cooperation at both regional and global levels.

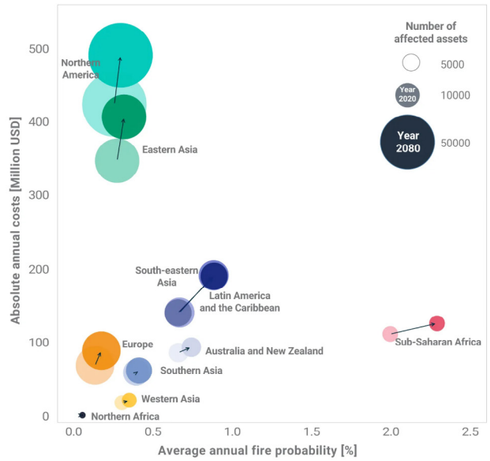
Introduction and Context

This knowledge exchange comes at a pivotal moment.
Forest fires have become a persistent, global threat. Driven by climate change, land-use shifts, and increasingly volatile weather patterns, fires are growing in frequency, intensity, and duration, placing people, ecosystems, and economies at ever-greater risk.

The urgency is particularly acute in Europe and Central Asia, where shared ecosystems and transboundary risks demand coordinated regional solutions. Türkiye, facing one of the region's most complex fire risk profiles, is emerging as a leader in building national resilience. The Türkiye Climate Resilient Forests Project, a $400 million initiative aims to strengthen forest fire prevention, preparedness, and response while safeguarding vulnerable communities and ecosystems from the broader impacts of climate change.

Türkiye's approach reflects the principles of integrated forest fire management: combining prevention, early warning, rapid response, community engagement, and supportive policies. These efforts align closely with the World Bank's Global Challenge Program: Forests for Development, Climate, and Biodiversity (GCP-F), a strategic framework for scaling forest-focused investments that reduce risk, improve livelihoods, and conserve nature.

By connecting country-level action with global strategy, Türkiye is helping catalyze a more coordinated, climate-smart approach to fire management worldwide. Lessons from Türkiye's leadership are informing World Bank operations in other regions, from Latin America to East Asia, where early warning systems, landscape restoration, and smarter land-use planning are central to building resilience.



This knowledge exchange, the first of its kind organized by the World Bank on this topic is helping mobilize multi-country coordination and technical expertise on this topic. Türkiye for example is actively considering hosting Forest Week in Istanbul in October 2025 to continue the dialogue by bringing in additional experts nationally and globally to discuss the linkages of forest and fire management.

Knowledge Exchange Objectives

The Türkiye Regional Fire Dialogue was convened to:

- Share innovative tools, policy frameworks, and on-the-ground practices in integrated forest fire management (IFM)
- Strengthen regional collaboration for cross-border fire preparedness and resilience
- Highlight Türkiye's evolving approach to forest fire prevention, detection, and rapid response
- Foster learning from global good practices in AI, early warning systems, and community engagement

The various sessions in the three-day knowledge exchange were structured to follow the lifecycle of integrated fire management approach of 5Rs—Review, Readiness, Risk Reduction, Response, and Recovery—alongside cross-cutting themes of technology, finance, and collaboration.

Overview of Participants

Over 150 participants attended the knowledge exchange. Country representatives from the ECA region included Azerbaijan, Bosnia, Georgia, Kazakhstan, Montenegro, Tajikistan, and Turkmenistan. International speakers from Albania, Australia, France, Korea, Portugal, and the United States also joined to share their experiences and successful approaches. Participants represented a diverse mix of stakeholders, including:

- National and subnational fire and forestry agencies from Türkiye
- Disaster risk management and climate change specialists
- Academic institutions and civil society organizations
- International development partners and technical experts

The World Bank, as convenor of the knowledge exchange, mobilized a diverse pool of experts to ensure a comprehensive discussion of forest fire management, spanning technical, social, communication and awareness, and financial dimensions, demonstrating the Bank's strong commitment to supporting knowledge exchange for countries. The World Bank was represented by a senior-level delegation, including:

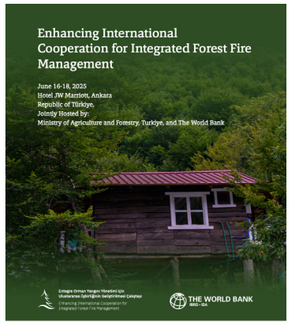
- Humberto Lopez (Country Director, Türkiye)
- Sameh Wahba (Regional Director, Planet ECA)
- Valerie Hickey (Global Director, Climate Change)
- Sanjay Srivastava (Regional DRM Manager, ECA)

By engaging directly with partners on the ground, Bank leadership worked to translate national climate priorities into actionable, country-level solutions, supporting investments in forest governance systems, early warning systems, preparedness, and integrated land-use planning.

The knowledge exchange also reinforced the World Bank's broader role as a "knowledge bank," convening partners to share innovations, facilitate cross-country learning, and promote evidence-based policy approaches. Lessons shared in Türkiye will inform future initiatives across the Europe and Central Asia region and inspire action in other fire-prone parts of the world.

Enhancing International Cooperation for Integrated Forest Fire Management

Agenda and Session Highlights



Program Brochure

Agenda

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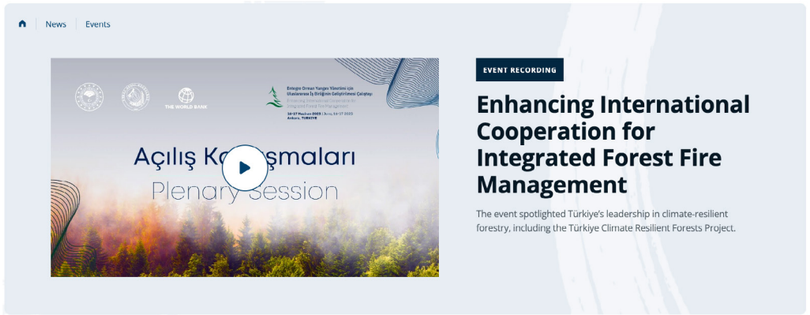

Watch all event recordings

Opening: Setting the Stage for Regional Cooperation

Key speakers in the opening and keynote sessions included senior leaders from Türkiye and the World Bank, and subject matter experts who set the tone for the event by highlighting the global and regional context of forest fires, national achievements, regional cooperation priorities, and the critical role of forest resilience in climate and development goals.

Key speakers for the opening included the following,

H.E. Ibrahim Yumaklı, Minister of Agriculture and Forestry, Türkiye
Highlighted Türkiye's national leadership in early fire detection, rapid response, and citizen volunteer mobilization to combat rising forest fire threats.

Bekir Karacabey, Director General, General Directorate of Forestry (OGM)
Presented Türkiye's evolving fire landscape and shared how its robust command system and prevention efforts helped contain 94% of 2024 fires under 10 hectares.

Humberto Lopez, Country Director for Türkiye, World Bank
Reaffirmed the World Bank's commitment to Türkiye's integrated, data-driven fire management and broader climate resilience agenda.

Sameh Wahba, Regional Director, Planet Practice Group, ECA, World Bank
Called for stronger cross-border collaboration and regional fire risk strategies to meet the growing challenge of extreme forest fires.

H.E. İbrahim Yumaklı, Minister of Agriculture and Forestry, opened the regional dialogue by underscoring Türkiye's high-level commitment to forest fire resilience and the importance of strong interagency coordination as a cornerstone of the country's approach.

Director General Bekir Karacabey, General Directorate of Forestry (OGM), outlined Türkiye's advancements in early detection, rapid response, and growing volunteer engagement, which have positioned the country as a regional leader. In 2024, Türkiye faced 3,797 forest fires, with 94 percent contained to under 10 hectares, demonstrating the impact of rapid mobilization and coordinated response.

From the World Bank, Humberto López reaffirmed the institution's strong partnership with Türkiye and its commitment to supporting integrated, data-driven fire management. Sameh Wahba, Regional Director, stressed the need for coordinated regional solutions and emphasized that this is not solely about disaster risk management support but about linking forest resilience to sustainable livelihoods and shared prosperity.

Valerie Hickey, Climate Change Global Director, facilitated a keynote session and, in her closing remarks, underscored the central role of forest resilience in the Bank's global climate strategy and its importance for achieving long-term climate and development goals.

Together, these opening messages highlighted the urgency of collective action in the face of intensifying fire risks and the need to align technical innovation with governance, community engagement, and long-term climate resilience.

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Türkiye's Forest Fire Challenge and Response

Türkiye's fire risk is significant: 15 million hectares—64% of its forest land—is classified as fire-prone. In 2024 alone, 3,797 forest fires were recorded, 82% of which were human-caused. OGM has responded by scaling its capabilities: more than 25,000 trained firefighters, 776 fire towers with 368 detection cameras, and an expanded volunteer force now exceeding 130,000 people. Despite the volume of fires, OGM successfully limited 94% of them to under 10 hectares.

The agency's fire management arsenal includes aerial and ground units—27 fixed-wing aircraft, 105 helicopters, and nearly 5,400 firefighting vehicles and earthmoving machines. A case study of the 2024 Bekirfakılar fire revealed the sophistication of OGM's response, which involved over 2,400 personnel and simultaneous management of more than 100 other fires.

Türkiye recorded over **3,700 forest fires in the first half of 2024**, with 82–84% attributed to human activity, resulting in the loss of **27,000 hectares**. OGM showcased its advanced fire preparedness systems, including:

- A national network of 776 lookout towers, 368 AI-enabled detection cameras, and 25,000 trained firefighters
- Rapid mobilization models like the Bekirfakilar Fire response, where 2,500 personnel were deployed within seven minutes
- Investment in command center infrastructure and planning systems for fire mitigation and response

Day 1: Country Frameworks and Fire Management Planning (June 16, 2025)

Keynote Session: Forest Fire Challenges and Solutions
Moderated by Valerie Hickey, Global Director for Climate Change at the World Bank, this session set the stage with a sharp overview of escalating forest fire risks globally and in Europe and Central Asia and spotlighted forward-looking solutions to build resilience at scale.

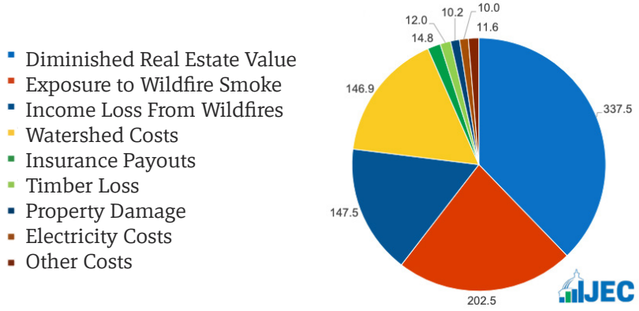
- **C3 Solutions - Nick Loris** quantified the economic and health costs of forest fires, stressing the need for preventive investment.
- **San Diego Supercomputer Center - Ilkay Altintas** emphasized data gaps and the role of fire tech ecosystems like Wildfire Commons.
- **FAO Silva Mediterranea - Giovanbattista De Dato** showcased Mediterranean strategies for fire-resilient landscapes through restoration and governance.

C3 Solutions | Nick Loris
A strong case was made for shifting forest fire policy from reactive suppression to proactive prevention. Global data shows that fire-related costs, including economic losses, health impacts, and environmental damage, are dramatically underestimated. Suppression costs alone are unsustainable, and the broader consequences of forest fires, including premature deaths and rising greenhouse gas emissions, underscore the urgent need for a comprehensive policy reform.

Key points:

- Forest fires caused **$132.6B in economic losses and $78.6B in insured damages** globally between 2015–2024.
- **Smoke-related illness** leads to **165,000–264,000 premature deaths/year**, costing **$200B annually**.
- In 2023, Canadian fires released **more carbon in five months** than **Russia and Japan's annual emissions** combined.
- **Up to 20% of global GHGs** come from forest fires; emissions have **risen 60% since 2001**.
- Every **€1 invested in prevention saves €4–7** in avoided losses.

Climate-Exacerbated Wildfires Cost As Much as $893 Billion Per Year
Top-end Annual Total Costs and Losses (Billions $)



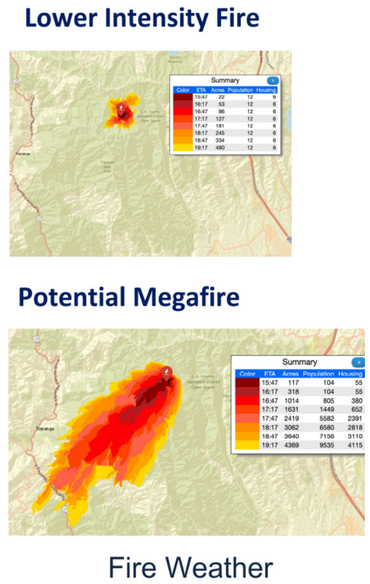
Note: Chart shows the higher end of the estimated range. Other Costs include evacuation costs, wildfire supression, direct death and injuries, insurance premium increases, learning loss, tourism loss, and psychological costs. Source: Analysis by JEC Democratic Staff, all values were adjusted for inflation into 2022 dollars.

The probability of forest fires and costs are expected to increase in every region of the world.

- Projected increase of forest fire intensity and frequency of 15% by 2030, 30% by 2050, and 50% by 2080 (World Meteorological Organization and United Nations).
- Potential burn area in Central Asia projected to increase by 2%–8% in the 2030s and 3%–13% in the 2080s (MDPI).
- By the end of the century, up to 18% of Southern Europe's land area could be subjected to catastrophic fire events as frequently as every other year (Nature).

San Diego Supercomputer Center | İlkay Altıntaş

While forest fires are a natural phenomenon, today's megafires are not—they are the result of climate extremes and decades of fuel accumulation. Addressing this challenge requires smarter, more nuanced data systems to guide decision-making. There is also an urgent need to close gaps in air quality modeling and fire behavior prediction to improve preparedness and response.



Key points:

- **19 of California's 20 largest forest fires** occurred in just the past 20 years.
- **No universal dataset** fits all fire management needs—approaches must be context-specific.
- There are major **data gaps in smoke and air quality modeling that limit assessment of the full impacts of forest fires including on human health**
- the Forest Fire Technology Commons is being developed by the Center to fast-track innovation in fire response and mitigation.

FAO Silva Mediterranea | Giovanbattista De Dato

FAO Silva Mediterranea, outlined a strategy to address the Mediterranean's rising fire vulnerability, emphasizing resilience, restoration, and regional cooperation. The approach calls for long-term investments in restoring degraded land, creating green jobs, and building the political momentum needed to drive sustained action.

Key points:

- **80.1 million hectares** in the Mediterranean region are suitable for ecological/forest restoration.
- Fires are increasing due to **climate change, land abandonment, and lack of preparedness**.
- Silva Mediterranea's priorities: **prevent forest fires, restore forests, enhance biodiversity, and create green jobs.**
- Emphasized that **resilience begins with planning, not emergency response**

Session 1: Fireside Chat – Toward a Resilient Region

Moderated by Leela Raina, this engaging discussion brought together senior representatives from Türkiye, Kazakhstan, Albania, and Azerbaijan for an open exchange on the escalating challenge of forest fire management and the imperative for stronger regional resilience. As climate change drives more frequent and severe forest fires, panelists shared how their national frameworks are evolving to address both immediate threats and build long-term preparedness. From Türkiye, Kenan Akduman, Deputy General Director, General Directorate of Forestry; from Kazakhstan, Anuarbek Bermagambetov, Chairman, Forestry and Wildlife Committee; from Albania, Agustin Pepkolaj, Fire Commissar, General Directorate of Fire and Rescue Service; and from Azerbaijan, Mohuma Herachiyev, Deputy Head, Forest Development Service, shared insights into policy shifts, operational innovations, and opportunities for regional cooperation.

Türkiye described how it is strengthening its centralized forest fire management system by investing in new technologies and improving data-driven monitoring, while also working to enhance local community engagement and interagency coordination. **Kazakhstan** emphasized the need to modernize outdated equipment, update legal frameworks, and better integrate forest fire risks into national disaster and environmental strategies. Kazakhstan shared their aspirations to host a regional hub for training and capacity building on fire management for Central Asia. **Albania** shared its efforts to balance environmental conservation with rising fire threats, highlighting the role of public awareness, local government involvement, and coordinated planning and trainings for response. **Azerbaijan** pointed to the vulnerability of its forested terrain and underscored the need to build technical capacity, improve early detection, and strengthen surveillance systems.

A central theme of the discussion was the importance of regional peer exchange. Panelists acknowledged the Türkiye Regional Dialogue as a valuable platform that is helping countries share experiences, explore solutions, and learn from one another. Although the nature, extent and drivers of fire were unique for each country, discussions revealed they all witnessed an escalation in occurrence and scale of fire events in recent history, which have been unprecedented and a clear departure from historical trends. The conversation further revealed common priorities to tackle challenges including the need to scale up early warning systems, invest in prevention and preparedness, enhance institutional coordination, and engage in cross-border collaboration. The session concluded with a clear message: regional knowledge sharing and cooperation are essential to building a more resilient future for forest landscapes across Europe and Central Asia.

Parallel Session 2: Review and Readiness for Risk Reduction

Moderated by Sanjay Srivastava, the session featured case studies from Korea, Australia, France, Canada, and discussants from the United States, Türkiye, Georgia, and Tajikistan, highlighting diverse forest fire risk reduction strategies being used, the successes achieved and shared challenges, and how the gaps are being addressed.

Korea - Kiyeon Ko presented advanced detection technologies and the use of UAVs.
Australia - Murray Carter highlighted strategies for adaptive fuel management.
France - Eric Flores shared insights on forest fire monitoring systems.
Canada - Maggie Julian outlined Canada's approach to mitigating forest fires
USA – Donna Black discussed the role of communities in forest fire management.

Discussants included speakers from Türkiye, Georgia and Tajikistan, highlighting shared risk profiles.

South Korea | Kiyeon Ko presented how Korea is experiencing increasingly severe forest fires, with massive fires in 2022, 2023, and a record-breaking blaze in spring 2025 that burned over 100,000 hectares, caused $716 million in damages, and resulted in 80 casualties. Key risk factors include accumulated forest fuel and prolonged drought conditions. Korea's approach emphasizes active thinning, integrating forest fire risk into forest planning, and transitioning from reactive to preventive forest policy. The President of the Korea Forest Fire Society underscored this integrated vision: "*To nurture the woods and to quell the fire are but one.*" Korea's co-development of the Integrated Forest Disaster Risk Management (IFDRM) framework with FAO reflects its leadership in aligning science, policy, and community engagement. However, public resistance to thinning and forest road construction remains a challenge.

Australia | Murray Carter presented Western Australia's adaptive fire management system, guided by the PPRR framework—Prevention, Preparedness, Response, and Recovery. Central to this approach is the *Bushfire Centre of Excellence*, which advances scientific research, traditional fire knowledge, training, and regional engagement. The Centre plays a vital role in community outreach and national collaboration, supporting knowledge sharing and the delivery of localized training. Western Australia's integrated model aims to build bushfire resilience by blending modern science, Indigenous practices, and cross-sectoral partnerships.

France | Eric Flores showcased the approach where France has implemented a forest fire strategy since the 1990s that focuses on early detection, prevention, and limiting fire spread. Despite 160,000 hectares burning annually, 90% of fires are contained under 5 hectares. Key tools include rapid detection, video surveillance, pre-positioning of firefighting resources, and mandatory brush clearing in the urban-forest interface. Climate change is extending the fire season, increasing fire intensity, and expanding risk zones to include agricultural lands. France's evolving interministerial plan emphasizes the need to adapt risk assessments beyond forests and to address worsening drought and heat conditions.

Canada | Maggie Julian highlighted the significance of national forests wherein Canada holds 9% of the world's forests—primarily boreal—and faces growing forest fire threats, with 2023 marking a record fire season. Fire response is managed at the provincial level, while the federal government provides scientific support, coordination, and international aid. Canada is shifting from suppression to prevention through forest thinning, prescribed burns, Indigenous-led practices, public education, and new technologies. National goals include enhanced collaboration, strengthened Indigenous partnerships, and increased investment in prevention.

United States | Chief Donna Black, presented the U.S. Fire Administration's (USFA) approach to developing a more data-driven and community-focused forest fire strategy. The USFA forest fire Briefing emphasized efforts to strengthen national resilience, particularly in wildland-urban interface areas. Key initiatives include integrating fire data into national systems like NERIS, addressing structure-to-structure spread and urban conflagrations, and emphasizing risk modeling, preparedness, and broad community engagement.

Türkiye | Prof. Ömer Küçük, presented the General Directorate of Forestry (OGM), centralized, technology-driven approach to forest fire management. The system integrates AI-powered early detection, UAVs, real-time risk mapping, and a rapid response fleet comprising 1,786 fire trucks, 105 helicopters, and 27 planes. Public engagement plays a key role, with 131,000 trained volunteers and national awareness campaigns such as "The Forest is Mine" and "Green Homeland." By combining strong governance, cutting-edge technology, and active citizen involvement, Türkiye is emerging as a potential regional center of excellence in forest fire management.

Georgia | Natia Lordanishvili outlined Georgia's efforts to manage its predominantly natural and mountainous forests, which cover roughly 45% of the country. With over 95% of forest fires caused by human activity, the National Forestry Agency is focusing on prevention, detection, and response through staff training, risk mapping, legal reforms, and public awareness. However, significant challenges remain, including outdated infrastructure, limited early warning systems, and resource constraints across all stages of fire management—preparedness, prevention, response, and restoration.

Tajikistan | Davlatali Sharipov shared how Tajikistan is advancing its Forest Development Program (2022–2026), which focuses on forest fire risk mapping, construction of roads and firebreaks, and pest management. These efforts are supported by legal frameworks such as the Law on Fire Safety. Although forest fires are relatively rare, the country faces significant challenges due to rugged terrain, limited equipment, and staffing shortages, all compounded by climate change. Key priorities include strengthening preparedness, enhancing interagency coordination, and building capacity within forest and fire services.

Session Takeaways

- **Prevention as a Priority**: Countries emphasized the need to lead with prevention and risk reduction. Traditional silvicultural practices, such as thinning and fuel management, and pre-emptive monitoring must be integrated into modern forest policy.
- **Economic Efficiency**: Investing in prevention is more cost-effective than allocating extensive resources to response and recovery after fires occur.
- **Cross-Sector Coordination**: Forest fires often escalate into disasters, but the solution begins with resilient forest governance. Effective coordination across forestry, climate, and disaster risk sectors is essential.
- **Regional Cooperation**: As climate change accelerates the frequency and intensity of fires, cross-border collaboration and shared early action mechanisms are increasingly important.
- **Blending Innovation and Tradition**: Success depends on combining high-tech solutions (AI, satellite imagery, digital risk maps) with traditional knowledge, Indigenous leadership, and community participation.

This session reinforced the importance of integrated fire management strategies that align policy, science, and community action to reduce forest fire risks and strengthen landscape resilience.

Parallel Session 3: Effective Response and Recovery

Moderated by Asferachew Abebe Abate, this session featured insights from multiple countries on advancing forest fire resilience through technology, policy, and community engagement:

Australia – Showcased innovations in bushfire intelligence tools aimed at enhancing early detection and response capabilities.

Portugal – Reflected on the country's policy shift toward prevention following the devastating 2017 fires.

Türkiye – Underscored the critical role of media engagement and combating disinformation in effective forest fire management.

OGM Türkiye & Portugal's Safe Village Program – Discussed integrated approaches to managing the wildland-urban interface, a growing zone of vulnerability.

United States (NFPA) – Highlighted the FireWise program as a successful example of community-driven forest ire preparedness and resilience.

Takeaway: Localized action on fuel, people, and buildings is critical for resilience.

Australia's National Science Agency | Justin Leonard
Australia's approach to quantifying and managing bushfire risk relies on advanced modeling and post-fire assessments. Key risk factors—including vegetation, terrain, and weather—are combined into a single fire hazard index to support region-specific strategies. A systematic impact survey tool is used to analyze post-fire damage, revealing correlations between fire intensity and loss patterns. This data-driven methodology informs fire-resilient building codes and land-use planning, helping to reduce fatalities and property loss.

Key points:

- Developed a **hazard index** that integrates vegetation, topography, and fire weather to model fire behavior across different regions.
- Modeling helps **anticipate future fire behavior under climate change scenarios**.
- Uses a **standardized bushfire impact survey tool** to track patterns of destruction.
- Data supports risk-based building regulations to improve fire resilience and save lives.

Agency for Integrated Rural Fire Management, Portugal | Tiago Oliveira
Portugal's national fire reform process emerged in response to the devastating 2017 forest fires. While fuel and weather are contributing factors, the fire crisis is deeply rooted in social and economic dynamics, including the extremely high rate of private forest ownership (97%). The country has shifted to a principles-based approach that emphasizes rural revitalization, behavioral change, and governance reform—underpinned by increased investment, particularly in prevention and mitigation.

Key points

- **97% of Portuguese forests are privately owned**, posing coordination challenges.
- Fire risk is largely shaped by **social and economic, not just environmental, factors**.
- Principles include: **valuing rural areas, active land management, behavior change, and efficient risk governance**.
- Since 2017, investment in fire management specifically in fire prevention measures increased **4.5x overall, with a 12x increase in prevention and mitigation**.
- The results of investing in prevention have influenced the national fire management policy significantly towards prevention.

OGM (General Directorate of Forestry), Türkiye | Mustafa Bostancı
Timely, accurate communication plays a critical role in forest fire response, as misinformation can be as dangerous as the fire itself. Türkiye uses multiple communication platforms to keep the public informed during emergencies. A case study from the 2021 Muğla-Yanıklar fire highlighted the role of Türkiye's Disinformation Combat Centre in fact-checking and correcting public safety messages across channels.

Key points

- **Effective communication is critical** for public safety and coordinated response.
- Uses **traditional media, social media, SMS alerts, and grassroots outreach**.
- Established a **Disinformation Combat Centre** to counter false information in real time, as a mitigation measure in fighting fires.
- Case study: **2021 Muğla-Yanıklar fire**, where communication efforts protected threatened communities.

OGM Türkiye & Portugal's Safe Village Program | Uğur Zeydanlı and António Patrão
Complementary strategies for managing the Wildland-Urban Interface (WUI)—the area where built environments meet natural vegetation—highlighted the importance of mapping and distinguishing between WUI "interface" and "intermix" zones. In Türkiye, WUI mapping informs planning and risk reduction efforts. In Portugal, the "Safe Villages – Safe People" initiative establishes defensible space around villages and engages residents in community-based risk education.

Key points

- WUI is the **critical zone where ecological and human systems meet**.
- Türkiye has implemented **nationwide WUI mapping** to inform local planning.
- Portugal's "**Safe Villages – Safe People**" initiative promotes **community engagement and defensible space creation**.
- Success relies on **ongoing local education and collaboration**.

NFPA (National Fire Protection Association), USA | Michele Steinberg
The Firewise USA program is a nationally recognized model for community-based forest fire risk reduction. It focuses on the Home Ignition Zone—the 30 to 60 meters surrounding a house—and provides a structured framework for local resident action groups to reduce risk. The program builds social cohesion by empowering neighbors to work together and sustain their efforts through an annual planning cycle.

Key points

- Focus on reducing ignition risk in the **Home Ignition Zone (30–60m around structures)**.
- Aims to **organize and empower residents** through structured, voluntary community groups.
- Promotes a "**neighbors helping neighbors" model** for risk awareness and action.
- Maintains relevance and momentum through **annual planning and review cycles**.

From Türkiye, Aşar Çakıroğlu; from Bosnia & Herzegovina, Dalila Efendić; and from the International Wildfire Alliance, Alan Sinclair offered valuable feedback that sharpened the dialogue and brought critical themes to the forefront. The perspectives shared underscored the importance of cross-country collaboration, the integration of local knowledge with technological innovation, and the need for sustained investment in prevention and capacity building.

From the session Effective Response and Recovery, a consistent message emerged: forest fires are becoming more severe and frequent, and even with improved firefighting capabilities, prevention and preparedness at the local level remain essential.

Key takeaways:

- **Fuels**: Forests and vegetation must be actively managed to reduce fuel loads.
- **People**: Communities must be aware of their risks and equipped to act during emergencies.
- **Buildings**: Construction and retrofitting should reflect the level of fire risk in the area.
- **Data**: Risk and impact must be systematically monitored and evaluated to track progress and improve strategies.

Day 2: Technology, Finance, and Collaboration (June 17, 2025)

Session 4: Technology Advancements for Integrated Fire Management

Moderated by **Nagaraja Rao Harshadeep**, this session highlighted two presentations to set the tone on use of technology in forest fire management

- **Türkiye | İlhami Aydın (OGM)** on AI-enabled detection and UAV use.
- **Korea | Kiyeon Ko** on the command system and evacuation alerts.

This was followed by rapid talks from private innovators to highlight diverse and emerging technologies for forest fire management. Speakers included:
Ororatech, Dryad Network, Earth Fire Alliance, Kodama Systems, BurnBot, Basarsoft, and **Skyward Wildfire**, demonstrating emerging tools for early detection, risk mapping, and response automation.

OGM (General Directorate of Forestry), Türkiye | İlhami Aydın
Türkiye's advanced fire detection and response systems leverage artificial intelligence and remote sensing to target high-risk fire zones. With a vast detection infrastructure—over 776 fire towers and more than 300 cameras—the General Directorate of Forestry (OGM) uses AI to analyze visual data and reduce false alarms. A fleet of UAVs operating from seven regional bases delivers real-time aerial imagery directly to fire trucks and command centers, improving response coordination. Fire losses are heavily concentrated in a one-month high-risk window between July 15 and August 15. OGM is also exploring innovative solutions such as aerial fire suppression dusts, though these remain in the research phase.

Key points:

- **AI used to identify high-risk fire zones and minimize false positives** in camera alerts.
- Network includes **776 fire towers and 300+ detection cameras** across Türkiye.
- **14 UAVs operating from 7 bases**, streaming live imagery to command centers and field units.
- Data analysis shows **disproportionate fire losses occur mid-July to mid-August**.
- Research ongoing into **aerially applied fire suppression dust**, not yet deployed operationally.

South Korea Forest Service | Kiyeon Ko
South Korea manages over 400 forest fires annually across a landscape where 64% of the land is forested. A high-tech, integrated detection and response system combines fire lookout towers, drones, and earth observation technologies, all feeding into a centralized digital command center. UAVs capable of night operations support early detection and reconnaissance, while smart command vehicles equipped with GPS tablets and live video enable dynamic response strategies, including long-distance hoselays. Public alert systems span SMS, mobile apps, TV, and sirens. The 2025 Yeongnam Mega Fire served as a case study, where intense wind and smoke overwhelmed aerial resources, testing the limits of even these advanced systems.

Key points

- Fire detection integrates **towers, drones, satellite imagery, and centralized command systems**.
- **UAVs conduct real-time detection and nighttime reconnaissance**.
- **Smart fire command vehicles** use GPS and live video for coordinated response.
- Ground response includes **hoselays up to 2 km into forests** using pulleys, tanks, and pumps.
- **Public evacuation alerts** sent via **SMS, mobile app, TV, and sirens**.
- Case study: **2025 Yeongnam Mega Fire** exposed limitations under extreme weather and resource strain.

Innovative Technologies – Rapid Tech Talks from Private Sector

A dynamic round of rapid talks showcased cutting-edge technologies from private sector innovators aiming to transform forest fire detection, mitigation, and suppression. These solutions highlighted how satellite, sensor, and robotic technologies are increasingly being adapted for integrated fire management systems worldwide.

Featured Speakers

- Ororatech: Satellite detection using a new mid-latitude-focused constellation for improved global fire monitoring.
- Earth Fire Alliance: Custom-designed satellite tech optimized for forest fire detection and rapid alerting.
- Skyward Wildfire Technologies: Novel system for cloud-to-ground lightning suppression using conductive dust delivered by aircraft.
- Dryad Network: SilvaNet sensors mounted on trees detect smoke chemicals and transmit via the Internet of Trees network.
- Kodama Systems: Remote-controlled logging machinery for firebreak creation, post-fire cleanup, and salvage operations.
- BurnBot: Remote-operated vegetation clearing and fireline preparation equipment for use in hazardous terrain.
- Basarsoft: Advanced GIS-enabled decision support tools for real-time firefighting operations and situational awareness.

Organization	5R Focus	What	Who	How	Where	Impact at Scale	Cost-Effectiveness
Basarsoft	Readiness	Develops GIS-based technologies and decision-support tools for real-time monitoring, spatial analysis, and disaster planning, including forest fire risk assessment.	Local governments, disaster response agencies, and forestry departments in TÃ¼rkiye and surrounding regions.	Mapping platforms and analytics to support data-driven decision-making, integrating environmental and infrastructure datasets.	Mediterranean and temperate forest ecosystems prone to drought-induced fires.	Enhances situational awareness and preparedness; scalable across sectors and geographies.	Cost varies by service scope; tailored solutions increase efficiency.
BurnBot	Reduction	Robotic technology for conducting controlled burns and reducing forest fire fuel loads.	Federal and state fire agencies, private landowners, and conservation organizations.	Remotely operated machines for prescribed burns in hazardous or hard-to-access areas.	Forests with underbrush or inaccessible terrain (chaparral, pine, conifer ecosystems).	Reduces risk to crews; scales up prescribed fire use.	Reduces per-acre costs, liability, and labor expenses.
Dryad Networks	Readiness	Ultra-early forest fire detection using AI-enabled, solar-powered sensors.	Utilities, municipalities, insurance firms, forest management authorities.	Mesh-networked gas sensors monitor for combustion gases in forests.	Remote, high-risk forest areas (boreal and temperate).	Reduces fire response time; avoids billions in damages.	Low-cost, solar-powered sensors; highly scalable.
Earth Fire Alliance	Readiness & Response	Nonprofit coalition providing real-time fire monitoring data for detection and response.	Governments, researchers, NGOs, response agencies worldwide.	FireSat constellation of 50+ satellites capturing multispectral fire data.	Global coverageâ€"tropical, boreal, and savannah zones coverageâ€"tropical, boreal, and savannah zones.	Improves global fire monitoring with high-resolution, frequent data.	Open data model lowers cost; high data throughput satellites.
Kodama Systems	Reduction	Automates forest thinning and biomass removal to reduce fire fuel loads.	Forest management agencies, landowners, timber operators.	Automation and data tools for mechanical thinning.	Dry conifer forests and fire-prone areas, especially western North America.	Addresses fuel treatment backlog; supports large-scale restoration.	Reduces labor costs; long-term fire suppression savings.
OroraTech	Readiness & Response	Satellite thermal imagin g for detection, monitoring, and forecasting fire behavior.	Governments, emergency agencies, insurers, infrastructure operators.	Thermal sensors detect fires and assess risk, delivering alerts.	Global; effective in ecosystems like Greece, Canada, Tasmania.	Rapid alerts and modeling improve early response.	Lower aerial monitoring cost; scalable commercial/ public use.
Skyward Wildfire Technologies	Reduction	Suppresses lightning strikes by managing atmospheric charge to prevent ignition.	Governments and utility companies.	Field systems reduce electric charge below ignition threshold.	High-lightning-risk zones (mountains, dry forested areas).	Potential to eliminate lightning fires; early deployment.	Pilot phase; long-term savings expected.

Session 5: Leveraging Financing for Fire Resilience

Moderated by Ghislain Yanou (World Bank Treasury), the session demonstrated that financing fire resilience can not only save government budgets, but also deliver returns on investments of up to 14$ in benefits per $ invested. Prevention pays. In the new reality – tighter budgets and declining aid, every dollar counts to spend better and mobilize more private capital. The session covered a wide menu of options to do more with less across multiple mechanisms including innovative instruments like Forest Resilience Bonds, Forecasted Mitigation Units for carbon markets, and risk-reduction insurance which are creating new pathways for private capital engagement. Success stories from Indonesia show that systematic policy reform and fiscal innovation can sustainably fund community-based prevention at scale, while technological innovations promise to transform fire management from reactive suppression to strategic prevention. The tools exist—scaling requires coordinated policy action, sustained political commitment, and continued innovation in blended finance mechanisms.

World Bank | Leela Raina, Economist
Targeted fiscal policies can make forest fire prevention far more cost-effective than suppression, with every $1 invested delivering $3 to $14 in benefits. Indonesia's reforms that allocate 1 percent of forestry revenues to community-based prevention in 731 high-risk villages, have reduced costs and improved resilience. Recommended measures include performance-based transfers, climate budget tagging, and linking funding to conservation outcomes, drawing on proven examples from India, Costa Rica, Portugal, and Brazil.

Blue Forest | Nick Wobbrock, Co-Founder and Chief Conservation Officer
The Forest Resilience Bond (FRB), is a blended finance model that mobilizes private capital for large-scale forest restoration. In Washington State, a 5,000-acre project cut high-severity fire risk by 80 percent, protected 16,000 acre-feet of water yield, and sustained up to 54 jobs. Scaling the approach requires aligning incentives across beneficiaries, from utilities and local governments, and securing long-term repayment commitments.

Forest Carbon Markets| David Saah, Remote Sensing and Forest Carbon Expert
Forecasted Mitigation Units (FMUs), are an ex-ante carbon crediting approach that monetizes avoided forest fire emissions by forecasting the carbon benefits of fuel treatments before fires occur. Each FMU represents one metric ton of anticipated CO_2e reductions, enabling public and private land managers to access carbon markets without upfront capital. In the Sierra Nevada, treatments covering 20 percent of a fireshed are projected to avoid 13 metric tons CO_2e per hectare, generating $2.9 to $3.9 million over five years. Treated forests can retain 93 percent more carbon during fires, making FMUs a scalable financing tool for both forest resilience and climate mitigation.

Climate Risk Initiative, UC Berkeley, and Former California Insurance Commissioner | Dave Jones, Director
In high-risk forest fire regions, escalating losses have driven insurers to withdraw coverage, leaving millions of homes unprotected. New resilience-based insurance models that factor in the benefits of proactive forest management, including parametric products that trigger payouts based on measurable fire events. In California's Tahoe Donner community, this approach secured $2.5 million in coverage while lowering premiums by 39 percent and deductibles by 84 percent. Integrating forest management into underwriting can reduce costs, maintain market access, and create strong financial incentives for investment in resilience.

Gordon and Betty Moore Foundation | Genny Biggs
Strategic philanthropy can accelerate technology-driven solutions for forest fire resilience. The Moore Foundation's Wildfire Resilience Initiative targets healthy, fire-adapted ecosystems and resilient communities by 2035, and ecologically beneficial fire dominance by 2075. Innovations supported include satellite-based monitoring (FireSat), autonomous aerial suppression (Rain), AI-enabled fuel treatment (BurnBot), and the BurnPro3D decision-support platform. Philanthropy acts as "society's venture capital," de-risking early-stage technologies and helping shift from reactive suppression to strategic prevention.

Indonesia's Ministry of Finance | Directorate General of Fiscal Balance
Indonesia is embedding forest fire prevention into its national budget framework through targeted fiscal transfers. Using the Forestry Revenue Sharing Fund and the Reforestation Fund, just 1 percent of forestry revenues has financed prevention activities in 731 fire-prone villages across eight provinces. Since a 2017 reform earmarked 50 percent of the Reforestation Fund for prevention, results include over 7,200 fire control facilities, patrols in 2,520 locations, and more than 6,600 firefighting operations. The 2025 budget prioritizes fire control infrastructure and Forest Management Units, showing how performance-based allocations and community empowerment can deliver results.

Indonesia Environment Fund (IEF)
The Indonesia Environment Fund (IEF) serves as the country's strategic platform for blending public and private climate finance to advance sustainable development, climate resilience, and the SDGs. Its programs span sustainable land use, clean energy, circular economy, water and food security, and disaster resilience, delivered through grants, loans, catalytic incentives, and debt-for-nature swaps. Flagship initiatives include the $1.5 million Terra Fund, which supports 108 Traditional Law Communities across 20 provinces, and the Catalytic Fund, which provides milestone-based incentives for impact ventures. IEF also manages REDD+ results-based payments—distributing $51 million to 34 provinces—and rooftop solar incentives totaling 15.5 MW of capacity. Through integrated governance, IEF ensures financing delivers measurable environmental outcomes, empowers communities, and scales successful models nationwide.

Organization	What	Primary Solution or Financing Innovation	Who	Key Partners and Stakeholders	How Mechanism and Delivery Model	Where Geographic or Ecosystem Applicability	Added Value
World Bank (Leela Raina)	Public finance strategies for forest fire prevention	Performance-based fiscal transfers and climate budget tagging	National and subnational governments	Ministries of Finance, Environment, Planning agencies	Integrates forest risk into fiscal transfer formulas and budget systems	Indonesia, India, Costa Rica, global applicability	Cost-effective prevention, targeted public spending, sustainable community finance
Blue Forest (Nick Wobbrock)	Public-private investment in forest restoration	Forest Resilience Bond (FRB)	Utilities, counties, investors, restoration partners	Yuba Water, CA State Agencies, Chelan County, NGOs	Private capital funds restoration, beneficiaries repay over time	Western U.S., forested watersheds and WUIs	Unlocks private capital, accelerates implementation, providesw co-benefits
Remote Sensing/ Carbon Expert (David Saah)	Carbon crediting based on avoided forest fire emissions	Forecasted Mitigation Units (FMUs)	Land managers, public/private forest owners	Climate crediting bodies, forest agencies	Pre-sell carbon credits using ex-ante modeling of avoided emissions	California, fire-prone forests globally	Access to carbon markets, no upfront cost, improves treatment design
Climate Risk Initiative (Dave Jones)	Insurance models that incentivize forest fire resilience	Forest fire Resilience Insurance (including parametric)	Homeowners, communities, insurers, brokers	WTW, The Nature Conservancy, Liberty, Tahoe Donner	Lower premiums/ deductibles based on forest management	California and forest fire-exposed U.S. communities	Keeps insurance viable, rewards risk reduction, protects assets
Gordon and Betty Moore Foundation (Genny Biggs)	Philanthropic funding of tech for forest ire resilience	Venture-style philanthropy for fire tech (BurnBot, FireSat, Rain)	Tech innovators, researchers, local fire agencies	BurnBot, FireSat, Rain, academic partners	Grants fund early-stage tech with potential for scale	Global tech deployment, especially in high-risk areas	Catalyzes innovation, fills financing gap for early-stage ideas
Indonesia Ministry of Finance	Fiscal transfers to fund subnational fire prevention	Forestry Revenue Sharing Fund (DBH Kehutanan)	Provincial and district governments	Local forest agencies, communities	Earmarked 1% of forest revenues for fire control and FMU operations	Indonesia, forest-rich and fire-prone provinces	Sustainable, local financing for fire resilience
Indonesia Environment Fund (IEF)	National blended finance platform for climate and environment		Communities, civil society, +D2:D8ministries, investors	UNDP, Ford Foundation, social forestry groups	Blends domestic and international funding for project support	Indonesia, across five thematic areas (AFOLU, energy, etc.)	Mobilizes climate finance, supports inclusive local action

Session 6: Collaboration for Forest Fire Management

Moderated by Natalie Çilem (WEF), this session highlighted the critical role of global platforms and emerging technologies in advancing coordination, collaboration, and best practices for integrated forest fire management.

FAO Global Fire Hub | Peter Moore
The FAO Global Fire Hub promotes a shift from reactive fire suppression to a more holistic approach known as Integrated Fire Management (IFM). This approach supports countries in building systems that incorporate prevention, preparedness, and community engagement. Anchored in five core pillars, the Hub provides tools, guidelines, and training to help governments and institutions develop and implement IFM policies tailored to local conditions

Earth Fire Alliance | Sean Triplett
The FireSat constellation is an advanced satellite-based forest fire detection system developed to deliver near real-time insights to incident command teams. FireSat combines high resolution and rapid refresh rates with minimal false positives, enabling faster and more accurate forest fire detection and response. Built on an open architecture, the system integrates with broader fire intelligence networks and frontline response systems.

Spatial Informatics Group | David Saah
Artificial intelligence (AI) is playing a transformative role in how forest fire risk is assessed and managed. Collaborative ecosystems—uniting academia, nonprofits, governments, and tech companies—are co-developing AI-powered fire tools that leverage Earth Observation (EO) data and machine learning. These tools provide actionable insights for early warning, detection, prediction, and coordinated response.

Asian Forest Cooperation Organization (AFoCO) | Sunpil Jin
AFoCO is leading regional efforts to build fire resilience across 17 member countries in Asia. Through initiatives like the ASEAN-Korea Cooperation Fund (AKCF) and Mekong-Korea Cooperation Fund (MKCF), AFoCO supports improved detection systems, early warning infrastructure, and capacity development. Partnerships with FAO and FFMA further strengthen education, governance reform, and applied research in forestfire management.

Key Takeaways:

- **Integrated Fire Management (IFM)** is essential for long-term resilience, combining prevention, early warning, community engagement, and supportive policy.
- **Regional and international collaboration** is critical—sharing data, tools, and strategies helps countries respond more effectively to growing fire risks.
- **Advanced satellite systems** like FireSat offer near real-time fire detection with high resolution and low false positives, enabling faster, more informed response.
- **Artificial intelligence and Earth Observation technologies** are transforming fire risk assessment, improving predictive modeling and turning data into decision-ready tools.
- **Capacity building and governance reform** are key to sustainable fire management—supported by e-learning, technical tools, and policy guidance.
- **Technology innovation** must be paired with local context, institutional alignment, and continued investment in training, education, and cross-border cooperation.

Closing Session: Turning Insight into Action

Representatives from OGM (Murat Cevirme), the World Bank (Sanjay Srivastava), and the Government of Turkmenistan (Mr. Goshjanov) called for bold, collective action to confront the growing threat of forest fires. They acknowledged that the role of technology in forest fire management is promising with newer and more cost effectiveness technologies being piloted for application at scale. They however urged that equally important is the need for countries to institutionalize shared practices across borders, scale up investment in prevention and adaptive land management, and align national strategies with regional and global platforms. Building partnerships and cross learning has a significant role in the evolving context of forest fires to help countries leap frog and learn from experiences from country peers in the region. Strengthening these pillars, they emphasized, is essential to building a more resilient, cooperative, and future-ready approach to integrated forest fire management.

4. 5. Proposed Follow-up Actions

- **Develop a regional community of practice (COP)** to sustain peer exchange and monitor shared threats
- **Scale use of AI and UAVs** through regional pilots
- **Organize follow-up dialogues** on forest governance, climate-smart land use, and data systems
- **Support integrated national strategies** that link land, fire, and climate action plans
- **Explore partnership opportunities with AFoCO, FAO, and private innovators** to strengthen capacity

Day 3: Site visit to OGM Fire Management Command Center

As part of the knowledge exchange, attendees had a site visit to the OGM Fire Management Command Center to witness firsthand how Türkiye monitors forest fires in real time. Participants observed the integrated system of satellite feeds, drone footage, and high-resolution thermal imaging that allows OGM to track fire activity across the entire country. The site visit showcased how advanced technologies and centralized coordination enable faster, data-driven decisions to prevent and control forest fires more effectively.

Conclusion and Recommended Next Steps

Based on the presentations, site visits, and discussions, several reflections have emerged regarding the current fire management approach and areas for further development:

1. Balanced 5R Approach to Forest Fire Management

Countries highlighted that while well-resourced and technically advanced fire suppression capabilities are critical, they should be part of a balanced "5R" approach: Review, Risk Reduction, Readiness, Response, and Recovery. Türkiye, for example, demonstrated advanced suppression capacity relative to the size of its forest estate, while Portugal shared how it shifted from a response-centric approach toward balancing all 5Rs, placing stronger emphasis on prevention, and has seen measurable success in reducing fire impacts. The shared lesson is clear: countries should avoid over reliance on response alone and instead integrate prevention, readiness, and recover measures into their strategies for lasting impact.

2. Enhancing National Interagency Coordination Mechanisms

Even in countries with long-standing forest fire management experience, gaps remain in coordination between forest authorities, disaster risk management agencies, and different tiers of government. Discussion underscored that effective interagency coordination is essential for preventing fires from spreading beyond forest boundaries, especially in the wildland urban interface. Breaking down institutional siloes, improving joint planning, and enhancing coordination, especially for cross-boundary fires that affect forest, agricultural, and urban lands, are priority actions for all countries aiming for effective and cost-efficient fire management.

3. Incident Command System (ICS) Adoption

Türkiye's recent high-impact fire seasons, including 2021, provide valuable lessons on how a standardized framework like the Incident Command System (ICS) can enhance multi-agency coordination. ICS is particularly effective during large, complex, or prolonged fire events involving authorities such as OGM, AFAD, police, and local governments. Türkiye's practical experience in managing complex incidents offers insights that other countries can adapt to their own operational and governance contexts. At the same time, Türkiye can draw on global best practices to further enhance and refine its ICS framework, ensuring even greater coordination and effectiveness in future fire seasons.

4. Integrating Fire Management into Broader Landscape and Forest Management /

Many countries presented targeted measures such strategic fuel breaks, road corridor treatments, and urban interface protection works. However, fewer examples demonstrated how these actions are embedded within broader forest and landscape management strategies, such as thinning, species selection, or prescribed burning. Evidence from multiple contexts, including research on Türkiye's Turkish Red Pine (Pinus brutia) and the Ponderosa Pine in North America, suggests that integrating low-severity fire into management regimes can enhance ecosystem resilience while reducing fuel loads. Lessons from countries successfully applying prescribed burning show that when combined with other silvicultural treatments, these practices can reduce fire risks, improve forest health, and strengthen the resilience of entire landscapes.

5. Building Partnerships to Scale Technology Adoption

Emerging technologies, ranging from real-time fire detection networks and AI-enabled risk assessment tools to integrated command and communications platforms, are transforming the way countries manage forest fires. Nations such as Türkiye, Portugal, and Australia have demonstrated how advanced capabilities can be developed and scaled through strong partnerships between governments, researcher institutions, and the private sector. The broader takeaway for all countries is that technology adoption is most effective when paired with collaboration: cross-country knowledge exchange, joint pilot projects, and adaption of tools to local contexts can help make these innovations more accessible, affordable, and impactful at scale.

Next Steps for Consideration:

Countries in the region continue the exchange on regular basis

Annex

Event and Resource Page: Enhancing International Cooperation for Integrated Forest Fire Management
The official event page provides an overview of the workshop objectives, structure, and participating institutions. It includes links to the full agenda, key thematic sessions, and a list of supporting partners. https://www.worldbank.org/en/events/2025/05/21/enhancing-international-cooperation-for-integrated-forest-fire-management?cid=eca_fb_turkey_en_ext

Presentation Materials from Speakers
Slide decks and recordings from plenary and parallel sessions are available for download on the World Bank's event portal. These materials cover topics such as prevention strategies, detection technologies, landscape management, and financing resilience. https://www.worldbank.org/en/events/2025/05/21/enhancing-international-cooperation-for-integrated-forest-fire-management?cid=eca_fb_turkey_en_ext#3

Op-Ed: Forest Fires Are Spreading—And So Must Global Solutions
Published in both the Turkish national press and on the World Bank's website, this op-ed highlights the urgent need for collective action to combat escalating forest ire risks. Drawing on global data and regional experiences—including Türkiye's 2021 forest fire season and recent investments in fire resilience—the piece makes a compelling case for prevention-focused policies, cross-border cooperation, and integrated fire management: Forest Fires Are Spreading—And So Must Global Solutions

EdCast Learning Journey: Integrated Forest Fire Management
This interactive learning journey on the World Bank's EdCast platform offers in-depth training modules on integrated fire management. It is available in: English, Spanish, Arabic, Thai, and Russian. The courese provides real-world case studies, video lessons, and quizzes to deepen understanding and support applied learning. Access the Learning Journey on EdCast

Survey Summary of Participant Feedback

Participants overwhelmingly rated the knowledge exchange as a high-quality and impactful. 9**3% rated the overall quality as "Excellent,"** and the remaining 7% as "Good," indicating the event met or exceeded expectations for nearly all attendees.

The technical depth was well-calibrated, with **87% of participants finding it "just right"** and 13% saying it was "too technical" -- suggesting future events may benefit from more introductory framing for some participants. The **balance between policy and technical discussions was another strength: 80% felt it was well-struck**, 13% found it only somewhat effective, and 7% did not respond.

Relevance to participants' work was also high, with **87% rating topics as "very relevant"** and 7% as "somewhat relevant." Encouragingly, **93% said they gained knowledge or tools they could apply in their work**.

All respondents who answered (100%) agreed the speakers were clear and effective. However, only 33% felt there was enough time for Q&A, while 53% said "somewhat", suggesting a need for more interaction in future sessions.

Open-ended feedback praised the blend of policy dialogue, technical case studies, and peer exchange. Suggestions for improvement included hosting annual meetings, developing ongoing online platforms, and expanding experiential learning opportunities.

ATTENDEES

Government of Türkiye	Name
OGM, General Director	Bekir Karacabey
OGM, Deputy General Director	İbrahim Yüzer
OGM, Deputy General Director	Kenan Akduman
OGM, Deputy General Director	Muhammed Salih Çetiner
OGM, Deputry General Director	Mustafa Özkaya
OGM	Yaşar Çakıroglu
OGM	İlhami Aydın
Deputy Minister of Agriculture and Forestry	Ahmet Bağcı
Department of the Inspection Board	Murat Çevirme
Department of Forest Management and Planning	Güven Gültekin
Department of Forest Management and Planning	Mustafa Kağan Özkal
Department of Forest Management and Planning	Davut Atar
Department of Forest Fire Combating	Alper Yılmaz
Department of Forest Fire Combating	Kamil Tolgay Dursun
Department of Forest Fire Combating	Oktay Çelikeoğlu
Department of Forest Fire Combating	Hasan Murat Ersöz
Department of Forest Fire Combating	Saki Çelik
Department of Forest Fire Combating	Ahmet Turan Yiğit
Directorate of Adana Forestry Regional	Tahsin Etli
Directorate of Antalya Forestry Regional	Kemal Kayiran
Directorate of Balıkesir Forestry Regional	Musa Şen
Directorate of Çanakkale Forestry Regional	Enver Demirci
Directorate of Hatay Forestry Regional	İlkay Günay
Directorate of İzmir Forestry Regional	Ahmet Dursun
Directorate of İzmir Forestry Regional	Mehmet Ozan Cevizli
Directorate of Mersin Forestry Regional	Rifat Atas
Directorate of Muğla Forestry Regional	Mustafa Ülkudur
Directorate of Communications	Mustafa Bostanci
DKM	Uğur Zeydanl

ECA Country Participants	Name
Azerbaijan, Forest Management Center in Forests Improvement Service	Mohuma Herachiyev
Azerbaijan, Agency on Forests Improvement	Mohuma Herachiyev
Bosnia, Federal Directorate of Civil Protection	Dalila Efendic
Bosnia, Federal Directorate of Civil Protection	Sasa Ljubojevic
Georgia, National Forestry Agency, Ministry of Environment Protection and Agriculture	Nino Gozalishvili
Georgia, National Forestry Agency, Ministry of Environment Protection and Agriculture	Natia Iordanishvili
Kazakhstan, Yertis Ormany Reserve	Kazbek Ametov
Kazakhstan, Forestry and Wildlife Committee	Anuarbek Bermagambetov
Montenegro, Ministry of Interior	Pera Pavlica-Dragisic
Tajikistan, Committee for Environmental Protection	Hamro Ahrorzoda
Tajikistan, Executive Office of the President of the Republic of Tajikistan	Darvesh Safarov
Tajikistan, Agency of Forestry and Committee	Davlatali Sharipov
Turkmenistan, Ministry of Environment Protection	Bayrammyrat Durdyyev
Turkmenistan, Ministry of Environment Protection	Ovezgeldi Goshjanov
Turkmenistan, Ministry of Environment Protection	Perman Hommatlyyev

Speakers	Name
Australia, CSIRO	Justin Earl Leonard
Australia, Department of Fire and Emergency Services (DFES) Australia	Murray Douglas Carter
Bellweather X (virtual)	Sarah Rusell
Blue Forest (virtual)	Nick Wobbrock
BurnBot (virtual)	Clinton Neuman
Canada, Northern Forestry Centre (virtual)	Maggie Julian
Cedara	David Saah
Co-founder, Basarsoft, Turkiye	Amet Dabanli
Director, Fire and Rescue Service, Southern France	Eric Flores
Dryad Network	Carten Brinkschulte
Dryad Network	Havva Dogan
Earth Fire Alliance	Sean Triplett
Evrim Bunn	United States, FEMA
FAO Silva Mediterranea (virtual)	Giovanbattista De Dato
Fire Chief, General Director for Fire Protection and Rescue Services, Ministry of Interior	Arben Cara
Fire Commisar, General Directorate of Fire and Rescue Service	Augustin Pepkolaj
International Wildfire Alliance	Alan Sinclair
Kodama Systems (virtual)	Joe Lerdal
Kodoma Systems	Merritt Jenkins
Korea, AFOCO	Sunpil Jin
Korea, Korea Forest Service	Chan-ho Yeom
Korea, Korea Forest Service (Retd)	Ki Yeon Ko
Oraratech	Konstantin Pieper
Portugal, Agency for Integrated Management of Rural Fires (virtual)	Tiago Oliveira
Portugal, Wildfire Expert	Antonio Carlos Da Cruz Patrao
Skyward (virtual)	Sam Goldman
Skyward Wildfire Technologies	Sam Goldman
The Gordon and Betty Moore Foundation (virtual)	Genevieve Biggs
Türkiye OGM	İbrahim YÜZER
Türkiye OGM	Kenan AKDUMAN
Türkiye OGM	Yaşar Çakıroğlu
Türkiye OGM	İlhami AYDIN
Türkiye Agriculture and Forestry	Ahmet Bağcı
Türkiye DKM	Uğur Zeydanlı
Türkiye Directorate of Communications	Mustafa Bostanci
Türkiye Kastamonu University	Ömer Küçük
Türkiye Karadeniz Teknik	Ercan Oktan
United States, C3 Solutions	Nicolas Devis Loris
United States, FEMA	Evrim Bunn
United States, National Fire Protection Association (virtual)	Michele Steinberg
United States, UC Berkeley	David Evan Jones
United States, University of San Diego	İlkay Altıntaş
Wildfire Expert, FAO	Peter Moore
World Economic Forum	Daniel Murphy
World Economic Forum, Global Network for Wildfire Leadership	Natalie Cilem
X prize	Kevin Marriott

World Bank Group	Name
Country Director	Humberto López
Regional Director, Planet Department, Europe & Central Asia Region (ECA)	Sameh Naguib Wahba
Climate Change Global Director in Planet Vice Presidency	Valerie Hickey
Regional Manager, Environment, Planet Department, Europe & Central Asia Region (ECA)	Sanjay Srivastava
Senior Natural Resources Management Specialist	Neeta Hooda
Environmental Economist	Leela Raina
Lead Environmental Specialist	Nagaraja Rao Harshadeep
Senior Environmental Specialist	Asferachew Abebe Abate
Fire Expert	Paul de Mar
Senior Financial Officer	Ghislain Martial Yanou
Program Assistant	Zhanna Terlyga
Agricultural Economist	Bora Surmeli
Lead Disaster Risk Management Specialist	Denis Jordy
Environmental Specialist	Emre Dolek
Environmental Specialist	Sibel Gulen
Consultant	Kitty Halpern
Consultant	Cansu Saygun
Consultant	Hande Bilir

Collaboration Network	Area of Expertise
AFoCO (Asian Forest Cooperation Organization)	Promotes sustainable forest management and climate resilience across Asia through capacity building, cooperation, and on-the-ground projects.
Earth Fire Alliance	Delivers real-time global fire data to support faster and smarter forest ire response.
European Union Working Groups on Fire	Coordinates fire prevention and response across EU member states through policy harmonization and shared strategies.
FAO Global Fire Management Hub	Supports countries with tools, training, and best practices for integrated fire management.
Google AI Collaborative	Accelerates responsible AI advancement through open collaboration and shared innovation.
Silva Mediterranea	Facilitates technical collaboration on forest and land use challenges in the Mediterranean region.
World Economic Forum (WEF) Global Wildfire Network	Develops cross-sector forest ire solutions and promotes innovation through global collaboration.

Technologists	Area of Expertise
Anadolu Agency	Turkiye's national news agency, supports public awareness and emergency coordination during forest fires.
Basarsoft	GIS technology provider in TÃ¼rkiye offering forest ire monitoring and decision-support tools.
The Bellwether Project at Alphabetâs X	Explores scalable technologies for forest fire prevention and forest monitoring.
BurnBot	Develops robotic systems for controlled burns to manage forest fire risk safely.
Dryad Networks	Provides ultra-early forest ire detection via AI-enabled, solar-powered gas sensors.
FIRESTAT	Delivers near real-time forest fire monitoring through the Earth Fire Alliance.
Kodama Systems	Uses automation and data tools for forest thinning and forest ire risk reduction.
KoÃ§ Holding	Supports innovation in environmental resilience and disaster response in TÃ¼rkiye.
Muon Space (FIRESAT)	Building a satellite system for fire and environmental risk monitoring.

OroraTech	Uses satellite thermal imaging for real-time forest fire detection and response.
Skyward Wildfire	Develops AI-powered aircraft systems for early forest fire detection and suppression.
XPRIZE Wildfire	Global competition to advance breakthrough forest fire detection and suppression technologies.

Financial Innovators	Area of Expertise
Blue Forest	Develops innovative finance solutions like Wildfire Resilience Bonds to fund forest restoration.
The Gordon and Betty Moore Foundation	Funds science-based forest ire resilience and forest management across the U.S. West.
University of California, Berkeley (UC Berkeley)	Advances forest ire research and resilience through academic and policy collaboration.
Spatial Informatics Group	Applies geospatial data and analytics to support forest ire risk forecasting and decision-making.
World Bank Treasury	Advises member countries on financial strategies for disaster risk and climate resilience.
World Bank GCP-F	Mobilizes forest-based investment through governance, community empowerment, and de-risked finance.

Addendum

Toward a Resilient Region: Shared Challenges and Insights on Forest Fire Management

Review and Readiness for Risk Reduction of Forest Fires

Effective Response & Recovery in Forest Fire Management

Technology advancements for Integrated Fire Management


Leveraging Financing for Fire Resilience
✓ strong monitoring and evaluation systems
✓ community engagement and stakeholder buy-in
✓ adaptive management allowing for course corrections
Where do we begin?
Thank you, happy to take your questions.
Leela Raina , Economist, World Bank
Leela RAINA


Leela RAINA
Ekonomist, Dünya Bankası -


Collaboration for Forest Fire Management
Altıncı Oturum | Session VI
Orman Yangınları Yönetiminde İş Birliği | Collaboration for Forest Fire Management
Natalie CILEM
Moderator
Ercan OKTAN
KTÜ
Natia IORDANISHVILI
Gürcistan
Georgia
Bayrammurat DURDYYEV
Türkmenistan
Turkmenistan


LLMs
Treatments
Orchestration
EARTH OBSERVABLES
Fuels
Fire Weather
Fire Behaviour Models
Fire Hazards
Structure Loss Data
Vulnerability
Risk
Reporting
David SAAH


Enhancing International Cooperation for
Integrated Forest Fire Management
IDOP

Entegre Orman Yangını Yönetimi için
Uluslararası İşbirliğinin Geliştirilmesi Çalıştayı

Enhancing International Cooperation for
Integrated Forest Fire Management

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